

REMARKS

Claims 1-4 are pending in the present application. Claims 1-4 are rejected. Claims 1-4 are herein amended. No new matter has been entered.

Claim Rejections - 35 U.S.C. §112

Claims 1-4 are rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. The Examiner notes that the claims recite derivatives of various materials, but the claims fail to clearly define the derivatives for each material. Thus the specification is not held to reasonably enable all derivatives for each material listed in the claims.

Claims 1-4 are further rejected under 35 U.S.C. §112, second paragraph, as being indefinite for the same reasons as in the rejection above.

Applicants herein amend claims 1 to 4 so that the limitation “an alkylbenzene derivative having a quaternary carbon directly bonded to a benzene ring and not having a cycloalkyl group directly bonded to the benzene ring” has been specified as “tert-amylbenzene.” This specific alkylbenzene derivative is described in the specification on page 8, line 24 – page 9, line 2, and Examples 1-14.

Applicants submit that this clarification renders the claim clearly understandable and supported in the specification.

Claim Rejections - 35 U.S.C. §103(a)

Claims 1-4 are rejected under 35 U.S.C. §103(a) as being unpatentable over JP 2002-298909 (JP '909) in view of JP 2002-050398 (JP '398).

The Examiner asserts that JP '909 teaches most of the claimed invention, but does not teach the electrolyte further including a cycloalkylbenzene. The Examiner asserts that JP '398 discloses adding phenylcyclohexane to a lithium battery nonaqueous electrolyte (abstract).

The Examiner concludes that it would have been obvious to modify the teachings of JP '909 by adding phenylcyclohexane to the nonaqueous electrolyte as taught by JP '398 because it would have improved the safety and reliability of the battery and prevented overcharging of the cell.

With respect to the cycloalkylbenzene derivative solvent ratio of 0.5 to 5 parts by mass of the non-aqueous solvent, the Examiner concludes that it would have been obvious to employ the instant solvent ratios because doing so is no more than discovering an optimum value of a result-effective variable, since a skilled artisan would have recognized that the amount of cycloalkylbenzene directly effects overcharging of the cell.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, the prior art references must teach or suggest all the claim limitations. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Finally, there must be a reasonable expectation of success. (Manual of Patent Examining Procedure §2142). The teaching or suggestion to make the claimed combination and

the reasonable expectation of success must both be found in the prior art, and not based on Applicant's disclosure.

Applicants herein amend the claims as noted above. Thereafter, Applicants disagree with the rejections, because not all of the claimed limitations are met by the cited combination of references. Particularly, the claimed alkylbenzene derivative being tert-amylbenzene is not taught by the cited combination of references.

Applicants note that JP '909 teaches a nonaqueous electrolyte battery having electrolyte containing a tert-butylbenzene derivative and an unsaturated cyclic carbonate derivative (vinylene carbonate). Applicants further note that JP '398 discloses adding phenylcyclohexane to a lithium battery nonaqueous electrolyte.

However, the tert-butylbenzene derivative of JP '909 contains not tert-butylbenzene itself, but a tert-butylbenzene derivative, which derivative must contain at least one halogen (abstract). As amended herein, the claimed alkylbenzene derivative is further limited to be tert-amylbenzene. The term "derivative" as used in the present invention is different from the "derivative" as used in JP '909, the derivatives of which include at least one halogen. The tert-alkylbenzene with a halogen attached to the benzene ring recited in JP2002-110229 (JP '229) is a different substance from tert-amylbenzene (tert-pentylbenzene). Therefore, the claimed alkylbenzene derivative is not met by the halogen-containing compound of the cited reference.

Applicants submit that one skilled in the art would not have been led to the particularly claimed components of the present invention, because the problem and solution as noted in the present specification are not noted in the prior art.

Applicants note that JP '398 is directed to an electrolytic solution containing phenyl-cyclohexane (cyclohexylbenzene). The object of JP '398 is to provide a battery that remains safe during overcharging while maintaining cycle characteristics and preservation characteristics. This is described in paragraph [0013] of the reference.

On the other hand, the main object of the present invention is to improve cycle characteristics under high temperature environments. It is because the present Inventors were aware of the object that they came up with the structure combining the cycloalkylbenzene derivative, tert-amylbenzene, and unsaturated cyclic carbonate derivative. Unless clearly aware of the object, one would not be able to come up with the inventive structure. This will be described in further detail below.

The object of JP2002-298909 (JP '909) is to provide a non-aqueous electrolytic solution for a lithium secondary battery that is superior in cycle characteristics and battery characteristics such as electric capacity and preservation characteristics under a charged state, as described in paragraph [0005]. The invention to accomplish this object is an electrolyte containing tert-pentylbenzene, and Examples of JP '909 (see paragraphs from 0023) are naturally the preferred embodiments for accomplishing the object. Examples 1, 2, 3, 4, 6 and 9 of JP '909 use an EC/PC/DEC mixture solution and Examples 7 and 8 use an EC/PC/DEC/DMC mixture solution. Thus, Examples of JP '909 do not recite use of an unsaturated cyclic carbonate derivative such as vinylene carbonate (VC).

Applicants further note that JP '909, in paragraph [0014], recites a lot of non-aqueous solvents including vinylene carbonate. However, they are merely exemplary non-aqueous

solvents. Applicants submit that it would be nearly impossible for one of ordinary skill to combine this recitation with the teachings of JP '398 in order to reach Applicants' claim 1. This will be described in further detail below.

Claim 1 recites, as the essential components of the electrolyte, a cycloalkylbenzene derivative, tert-amylbenzene, and an unsaturated cyclic carbonate derivative. It is only by this structure that significantly superior high-temperature cycle characteristics are obtained. This has support in Table 1 in the specification.

In Table 1, cells A8-A14, which used non-aqueous solvents containing the three components, had high-temperature cycle characteristics (%) of 70-84%, among which cells A8-A10 and A12-A14 had high-temperature cycle characteristics of over 80%.

Cells X2 and X3, which contain a cycloalkylbenzene derivative but not a tert-alkylbenzene, had high-temperature cycle characteristics of 54% and 45%, respectively. Cells X4 and X5, which contained a tert-alkylbenzene but not a cycloalkylbenzene derivative, had high-temperature cycle characteristics of 61% and 60%, respectively. Cells A1-A7, which contained a cycloalkylbenzene derivative and tert-alkylbenzene but not an unsaturated cyclic carbonate derivative, had high-temperature cycle characteristics of 53-63%.

These advantageous effects are appreciated only when cells are actually made.

Applicants note that none of JP '909 recites any examples where the cycloalkylbenzene derivative and tert-pentylbenzene were actually combined and where cycloalkylbenzene derivative and unsaturated cyclic carbonate derivative were actually combined. Further, the references do not recite any examples where the tert-pentylbenzene and unsaturated cyclic

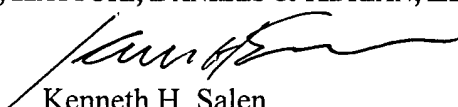
carbonate derivative were actually combined. Naturally, the references do not recite any examples where the three claimed components were combined. One of ordinary skill in the art would therefore have had no motivation to combine the three components. Thus, the present invention is non-obvious over JP '398 and JP '909.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
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